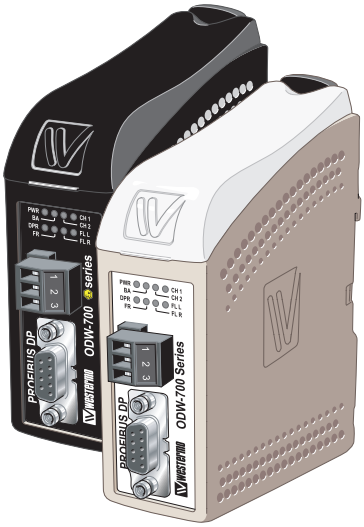
User Guide
6651-2201

# ODW-710-F1

Fibre Optic Modem




***Industrial Converter***
***PROFIBUS DP to***
***Fibre Optic Link.***
***Point to Point applications***

www.westermo.com

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**http://www.westermo.com**

# Safety

**Before installation:**

Read this manual completely and gather all information on the unit. Make sure that you understand it fully. Check that your application does not exceed the safe operating specifications for this unit.

This unit should only be installed by qualified personnel.

This unit should be built-in to an apparatus cabinet, or similar, where access is restricted to service personnel only.

The power supply wiring must be sufficiently fused, and if necessary it must be possible to disconnect manually from the power supply. Ensure compliance to national installation regulations.

Branch circuit protection (fuse) is required for this unit with rating not exceeding 20 A.

Product should be connected to UL Listed power supplies rated 12 – 48 VDC, min 500 mA or 24 VAC, min 500 mA or reliably grounded DC SELV source*.

This unit uses convection cooling. To avoid obstructing the airflow around the unit, follow the spacing recommendations (see Cooling section).

**Before mounting, using or removing this unit:**

Prevent access to hazardous voltages by disconnecting the unit from the power supply.

Warning! Do not open a connected unit. Hazardous voltages may occur within this unit when connected to a power supply.

**Class 1 Laser Product**

This unit is designed to meet the Class 1 Laser regulations. However, the user is warned not to look directly into fibre optical fibre port or any connected fibre.

**Care recommendations**

Follow the care recommendations below to maintain full operation of the unit and to fulfil the warranty obligations.

This unit must not be operated with covers or lids removed.

Do not attempt to disassemble the unit. There are no user serviceable parts inside.

Do not drop, knock or shake the unit. Rough handling beyond the specification may cause damage to internal circuit boards.

Do not use harsh chemicals, cleaning solvents or strong detergents to clean the unit.

Do not paint the unit. Paint can clog the unit and prevent proper operation.

Do not expose the unit to any kind of liquids (rain, beverages, etc).

The unit is not waterproof. Keep the unit within the specified humidity levels.

Do not use or store the unit in dusty, dirty areas. Connectors as well as other mechanical parts may be damaged.

If the unit is not working properly, contact the place of purchase, nearest Westermo distributor office, or Westermo Tech support.

Fibre connectors are supplied with plugs to avoid contamination inside the optical port. The plug should be fitted when no optical fibre is inserted in the connector, e.g. during storage, service or transportation.

* Applicable for ODW-710-F1 only

### Note. Fibre Optic Handling

Fibre optic equipment requires careful handling as the fibre components are very sensitive to dust and dirt. If the fibre is disconnected from the modem, the protective plug on the transmitter/receiver must be replaced. The protective plug must be kept on during transportation. The fibre optic cable must also be protected in the same way.

If this recommendation is not followed, it can jeopardise the warranty.

### Cleaning of the optical connectors

In the event of contamination, the optical connectors should be cleaned by using forced nitrogen and some kind of cleaning stick.

Recommended cleaning fluids:

- Methyl-, ethyl-, isopropyl- or isobutyl-alcohol
- Hexane
- Naphtha

### Maintenance

No maintenance is required, as long as the unit is used as intended within the specified conditions.

## Agency approvals and standards compliance

| Type | Approval / Compliance |
|---|---|
| EMC | EN 61000-6-1, Immunity residential environments |
| | EN 61000-6-2, Immunity industrial environments |
| | EN 61000-6-3, Emission residential environments |
| | EN 61000-6-4, Emission industrial environments |
| | EN 55022, Emission IT equipment, class A |
| | EN 55024, Immunity IT equipment |
| | FCC part 15 Class A |
| | EN 50121-4, Railway signalling and telecommunications apparatus |
| | IEC 62236-4, Railway signalling and telecommunications apparatus |
| Safety | UL/CSA/IEC/EN 60950-1, IT equipment* |
| | EN 60950-1, IT equipment** |
| ATEX** | EN 60079-0 and EN 60079-15 |

* Applicable for ODW-710-F1 only
** Applicable for ODW-710-F1 Ex only

**FCC Part 15.105 Notice:** This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.
This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

**EN 55022 Notice:** This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

## ATEX Information (Applicable for ODW-710-F1 EX only)

### General

This unit is intended for use in Zone 2 hazardous location only.

### Marking

Ex II 3 G
Ex nA IIC T4 Gc
SPECIAL CONDITION
WARNING – DO NOT SEPARATE WHEN ENERGIZED

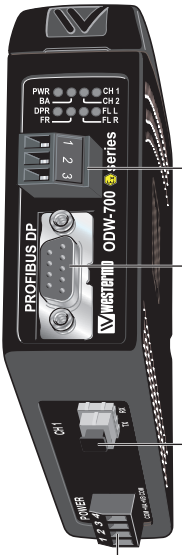
| | |
|---|---|
| Ex | Indicate that this unit complies with relevant European standards that are harmonised with the 94/9/EC Directive (ATEX). |
| **II** | Equipment group II.<br>This unit can be installed in all places with an explosive gas atmosphere other than mines susceptible to firedamp |
| **3** | Equipment category 3.<br>A category is the classification according to the required level of protection. This unit ensures the requisite level of protection during normal operation and is intended for use in areas in which explosive atmosphere caused by gases, vapours, mists, or dust mixtures are unlikely to occure or, if they do occure, are likely to do so only infrequently and for a short periode only. |
| **G** | Indicates protection concerning explosive atmospheres caused by gases, vapours or mists (G). |
| **Ex** | Indicates that this unit is in conformity with relevant European Ex standard(s). |
| **nA** | Type of protection used.<br>This unit is a non-sparking device "nA" which is constructed to minimize the risk of occurence of arcs or sparks capable of creating an ignition hazard during conditions of normal operation. |
| **IIC** | Gas group, a typical gas i hydrogen. |
| **T4** | Temperature class T4 (T4 = 135°C).<br>This unit is classified in accordance with its maximum surface temperature (external and internal). |
| **Gc** | Equipment protection level Gc (EPL Gc).<br>Equipment for explosive gas atmospheres, having a "enhanced" level of protection, which is not a source of ignition in normal operation and which may have some additional protection to ensure that it remains inactive as an ignition source in the case of regular expected occurences. EPL Gc are analogous to the ATEX Categories (Category 3 G = EPL Gc). |
| **SPECIAL CONDITION** | This unit has a special condition of use.<br>The special condition for safe use contains safety related information that is necesarry for the correct installation and safe use. |

## Ratings

| | |
|---|---|
| **Power** | (12 – 48) VDC; 300 mA |
| **Ambient temperature** | –40°C ≤ Ta ≤ +70°C |
| **Ingress protection (IP)** | IP21 |
| **Maximum surface temperatur** | 135°C (temperature class T4) |

## Safety Control Drawing

| | |
|---|---|
| **Degree of protection** | IP 21 |
| **Ambient temperature** | –40°C to +70°C |
| **Installation spacing** | Minimum 25 mm above / below<br>Minimum 10 mm left / right |



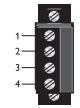

| Position | Descripton | Input / Output values |
|---|---|---|
| 1 | In & out / Relay contact (NO) | $U_{in}$ = 60 VDC max<br>$I_{in}$ = 500 mA max |
| 2 | In & out / Relay contact (C) | |
| 3 | In & out / Relay contact (NC) | |

Galvanically isolated via mechanical relay.
See user manual for proven transient protection.

| Position | Descripton | Input / Output values |
|---|---|---|
| 1 | – / – | $U_{max}$ = ± 5 Vpk<br>$I_{max}$ = ± 400 mA<br>Data rate:<br>9600 bit/s to 12 Mbit/s |
| 2 | – / – | |
| 3 | In/out / RxD/TxD-P | |
| 4 | Out / CNTR-P | |
| 5 | – / DGND | |
| 6 | Out / VP | |
| 7 | – / – | |
| 8 | In/Out / RxD/TxD-N | |
| 9 | Not connected | |

| Position | Descripton | Output values |
|---|---|---|
| Rx | In / Receive port | Max 0 dBm |
| Tx | Out / Transmit port | |

| Position | Descripton | Intput values |
|---|---|---|
| 1 | In / Common | $U_{in}$ = (10 – 60) VDC<br>$I_{in}$ = 400 mA max<br>$P_{In}$ = Max 4 W |
| 2 | In / +Voltage A | |
| 3 | In / +Voltage B | |
| 4 | In / Common | |




See section *Type tests and environmental conditions* in this user manual for proven transient protection.

## SPECIAL CONDITION FOR SAFE USE

**Ambient temperature:**

This unit is designed for use in extreme ambient temperature conditions as follows:
–40 °C ≤ Ta ≤ +70 °C

**Installation in an apparatus cabinet:**

This unit requires installation in an Ex certified apparatus cabinet suitable for the area of use and providing a degree of protection of at least IP54.

**Resistance to impact:**

This unit requires installation in an apparatus cabinet where adequate resistance to impact is provided by the apparatus cabinet. See "Installation in an apparatus cabinet" above for requirements on the external apparatus cabinet.

**Resistance to light:**

This unit requires installation in an apparatus cabinet where it is protected from light (for example daylight or light from luminaires).
See "Installation in an apparatus cabinet" above for requirements on the external apparatus cabinet.

**Secureness of plugs:**

When this unit is installed in an explosive atmospheres, all connectors must be mechanically secured to prevent loosening.

**Conductor temperature:**

When this unit is installed in locations with high ambient temperature, special precautions shall be taken upon the choice of external conductors and the temperature rating of the conductor(s).

**Directive 94/9/EC alongside with other directives:**
Directive 2004/108/EC (EMC) applies and to assure a safe performance of this unit under the scope of Directive 94/9/EC, refer to the electromagnetic immunity level specified under "Type tests and environmental conditions" in this manual.

**Standards and date of compliance**

EN 60079-0 and EN 60079-15
2010-12-17

Westermo Teleindustri AB

# Declaration of conformity

The manufacturer Westermo Teleindustri AB
SE-640 40 Stora Sundby, Sweden

Herewith declares that the product(s)

| Type of product | Model | Art no |
|---|---|---|
| Industrial fiberoptic repeaters/media converters | ODW-700 series | 3651-07xx |
| | ODW-700EX series | 3651-37xx |

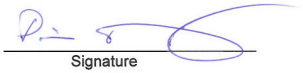
is in conformity with the following EC directive(s).

| No | Short name |
|---|---|
| 2004/108/EC | Electromagnetic Compatibility (EMC) |
| 94/9/EC[1] | Equipment Explosive Atmospheres (ATEX) |

References of standards applied for this EC declaration of conformity.

| No | Title | Issue |
|---|---|---|
| EN 61000-6-1 | Electromagnetic compatibility – Immunity residential environments | 2007 |
| EN 61000-6-2 | Electromagnetic compatibility – Immunity industrial environments | 2005 |
| EN 61000-6-3 | Electromagnetic compatibility – Emission residential environments | 2007 |
| EN 61000-6-4 | Electromagnetic compatibility – Emission for industrial environments | 2007 |
| EN 55022 | Information technology equipment - Emission | 2006 + A1:2007 |
| EN 55024 | Information technology equipment - Immunity | 1998 + A1:2001 + A2:2003 |
| EN 50121-4 | Railway applications – Electromagnetic compatibility – Emission and immunity of the signalling and telecommunications apparatus | 2006 |
| EN 60079-0 | Explosive atmospheres – Equipment – General requirements | 2009 |
| EN 60079-15 | Electrical apparatus for explosive gas atmospheres – Construction, test and marking of type of protection “n” electrical apparatus | 2005 |

The last two digits of the year in which the CE marking was affixed: 11



Signature

Pierre Öberg
Technical Manager
15th June 2011

[1] Applicable for ODW-700EX series only.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|---|---|---|---|---|---|---|
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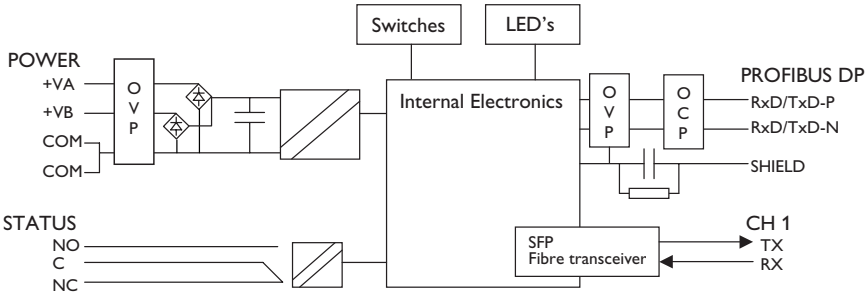
| Sweden | Int+46 16428000 | Int+46 16428001 | | | | |

## Type tests and environmental conditions

| Electromagnetic Compatibility | | | |
|---|---|---|---|
| **Phenomena** | **Test** | **Description** | **Level** |
| ESD | EN 61000-4-2 | Enclosure contact | ± 6 kV |
| | | Enclosure air | ± 8 kV |
| RF field AM modulated | IEC 61000-4-3 | Enclosure | 10 V/m 80% AM (1 kHz), 80 – 800 MHz<br>20 V/m 80% AM (1 kHz), 800 – 1000 MHz<br>20 V/m 80% AM (1 kHz), 1400 – 2700 MHz |
| RF field 900 MHz | ENV 50204 | Enclosure | 20 V/m pulse modulated 200 Hz, 900 ± 5 MHz |
| Fast transient | EN 61000-4-4 | Signal ports | ± 2 kV |
| | | Power ports | ± 2 kV |
| Surge | EN 61000-4-5 | Signal ports unbalanced | ± 2 kV line to earth, ± 2 kV line to line |
| | | Signal ports balanced | ± 2 kV line to earth, ± 1 kV line to line |
| | | Power ports | ± 2 kV line to earth, ± 2 kV line to line |
| RF conducted | EN 61000-4-6 | Signal ports | 10 V 80% AM (1 kHz), 0.15 – 80 MHz |
| | | Power ports | 10 V 80% AM (1 kHz), 0.15 – 80 MHz |
| Pulse Magnetic field | EN 61000-4-9 | Enclosure | 300 A/m, 6.4 / 16 µs pulse |
| Voltage dips and interruption | EN 61000-4-11 | AC power ports | 10 & 5 000 ms, interruption<br>200 ms, 40% residual voltage<br>500 ms, 70% residual voltage |
| Mains freq. 50 Hz | EN 61000-4-16 | Signal ports | 100 V 50 Hz line to earth |
| Mains freq. 50 Hz | SS 436 15 03 | Signal ports | 250 V 50 Hz line to line |
| Radiated emission | EN 55022 | Enclosure | Class B |
| | FCC part 15 | | Class A |
| Conducted emission | EN 55022 | AC power ports | Class B |
| | FCC part 15 | AC power ports | Class B |
| | EN 55022 | DC power ports | Class A |
| Dielectric strength | EN 60950 | Signal port to all other isolated ports | 2 kVrms 50 Hz 1min |
| | | Power port to other isolated ports | 3 kVrms 50 Hz 1min<br>2 kVrms 50 Hz 1min (@ rated power < 60V) |
| **Environmental** | | | |
| Temperature | | Operating | –40 to +70°C |
| | | Storage & Transport | –40 to +70°C |
| | | Maximum surface temperature | 135°C (temperature class T4) |
| Humidity | | Operating | 5 to 95% relative humidity |
| | | Storage & Transport | 5 to 95% relative humidity |
| Altitude | | Operating | 2 000 m / 70 kPa |
| Service life | | Operating | 10 year |
| Vibration | IEC 60068-2-6 | Operating | 7.5 mm, 5 – 8 Hz<br>2 g, 8 – 500 Hz |
| Shock | IEC 60068-2-27 | Operating | 15 g, 11 ms |
| **Packaging** | | | |
| Enclosure, ODW-710-F1 | UL 94 | PC / ABS | Flammability class V-1 |
| Enclosure, ODW-710-F1 EX | | Cabelec 6141 | |
| Dimension W x H x D | | | 35 x 121 x 119 mm |
| Weight | | | 0.26 kg |
| Degree of protection | | | IP 21 |
| Cooling | IEC 529 | Enclosure | Convection |
| Mounting | | | Horizontal on 35 mm DIN-rail |

# Functional description




OVP Over Voltage Protection
OCP Over Current Protection

### Converter PROFIBUS DP – optical fibre

ODW-710-F1 is a fibre optic modem that converts between electrical PROFIBUS DP and a fibre optical link.

### Data rate up to 12 Mbit/s

ODW-710-F1 converts PROFIBUS DP data using data rates from 9 600 bit/s up to 12 Mbit/s. Retiming of the PROFIBUS DP data ensures that the correct signal form is transmitted from the ODW-710-F1 converter.

### Automatic data rate detection

The PROFIBUS data rate is set automatically as soon as the ODW-710-F1 receives a correct data frame, whether data is received from PROFIBUS DP or the fibre optic link. The detected data rate remains until a number of consecutive faulty received frames have been detected or no further frames are detected within the timeout period. The timeout period is set by switches, with the default setting of 31 faulty frames or 5 seconds without any received frames.

# Interface specifications

| Power | |
|---|---|
| Rated voltage | ODW-710-F1: 12 to 48 VDC and 24 VAC<br>ODW-710-F1 Ex: 12 to 48 VDC |
| Operating voltage | ODW-710-F1: 10 to 60 VDC and 20 to 30 VAC<br>ODW-710-F1 Ex: 10 to 60 VDC |
| Rated current | 300 mA @ 12 VDC<br>150 mA @ 24 VDC<br>75 mA @ 48 VDC |
| Rated frequency | ODW-710-F1: DC and 48 to 62 Hz<br>ODW-710-F1 Ex: DC |
| Inrush current $I^2t$ | 0.2 $A^2s$ |
| Startup current* | 1.0 Apeak |
| Polarity | Reverse polarity protected |
| Redundant power input | Yes |
| Isolation to | PROFIBUS DP and Status port |
| Connection | Detachable screw terminal |
| Connector size | 0.75 – 2.5 $mm^2$ (AWG 18 – 13)<br>Connect the unit using at least 18 AWG (0.75 $mm^2$) wiring |
| Shielded cable | Not required |

* External supply current capability for proper startup

| Status | |
|---|---|
| Port type | Signal relay, changeover contacts |
| Rated voltage | Up to 48 VDC |
| Operating voltage | Up to 60 VDC |
| Contact rating | 500 mA @ 48 VDC |
| Contact resistance | < 50 mΩ |
| Isolation to | PROFIBUS DP and Power port |
| Connection | Detachable screw terminal |
| Connector size | 0.2 – 2.5 $mm^2$ (AWG 24 – 13) |
| Shielded cable | Not required |

| PROFIBUS DP (RS-485) | |
|---|---|
| Electrical specification | EIA RS-485 / EN 50 170 |
| Data rate | 9 600 bit/s, 19.2, 93.75, 187.5, 500 kbit/s, 1.5, 3, 6 and 12 Mbit/s |
| Data format | 8 data bits, even parity, 1 stop bit, 11 bits total |
| Protocol | PROFIBUS DP / EN 50170 |
| Data Rate detection | Yes, compliant with EN 50 170 |
| Retiming | Yes |
| Turn around time | In accordance with EN 50 170 |
| Transmission range | ≤ 1200 m, depending on data rate and cable type (EIA RS-485) |
| Settings | None, external termination and failsafe biasing |
| Protection | Installation Fault Tolerant (up to ±60 V) |
| Isolation to | Power and Status port |
| Connection | 9-pin D-sub female |
| Shielded cable | Not required |
| Conductive housing | Isolated to all other circuits and housings |

**Optical Power Budget**

The allowed link length is calculated from the optical power budget (OPB), the available optical power for a fibre-optic link, and the attenuation of the fibre, comprising losses due to in-line connectors, splices, optical switches and a margin for link ageing (typical 1.5 dB for 1300 nm).

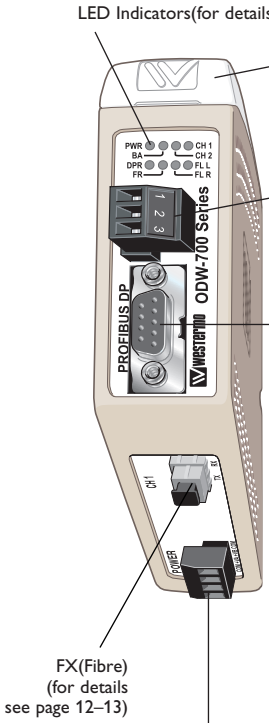
The worst-case optical power budget (OPB) in dB for a fibre-optic link is determined by the difference between the transmitter's output optical power (min) and the receiver input sensitivity (max).

| FX (Fibre) | SM-LC80 | SM-LC40 | SM-LC20 | MM-LC2 |
|---|---|---|---|---|
| Fibre connector | LC duplex | LC duplex | LC duplex | LC duplex |
| Fibre type | Singlemode 9/125 µm | Singlemode 9/125 µm | Singlemode 9/125 µm | Multimode, 62.5/125 µm |
| Wavelength | 1550 nm | 1310 nm | 1310 nm | 1310 nm |
| Transmitter Output optical power min/max | –5/0 dBm | –5/0 dBm | –15/–8 dBm | –20/–14 dBm |
| Receiver Input sensitivity, max | –35 dBm | –35 dBm | –34 dBm | –31 dBm |
| Receiver Input optical power, max | 0 dBm | 0 dBm | 0 dBm | –8 dBm |
| Optical power budget, worst-case | 30 dB | 30 dB | 19 dB | 11 dB |
| Transceiver type | Small Form Factor Pluggable (SFP) Multi-Sourcing Agreement (MSA) compliant | | | |
| Laser class | Class 1, IEC 825-1 Accessible Emission Limit (AEL) | | | |

| **FX (Fibre)** | **Bi-Di LC-40** | **Bi-Di LC-20** |
|---|---|---|
| Fibre connector | LC Simplex | LC Simplex |
| Fibre type | Singlemode 9/125 µm | Singlemode 9/125 µm |
| Wavelength nm, connector 1<br>Wavelength nm, connector 2 | Tx 1310, Rx 1550<br>Tx 1550, Rx 1310 | Tx1310, Rx 1550<br>Tx 1550, Rx 1310 |
| Transmitter<br>Output optical power min/max | –8/0 dBm | –14/8 dBm |
| Receiver<br>Input sensitivity, max | –34 dBm | –32 dBm |
| Receiver<br>Input optical power, max | –3 dBm | 0 dBm |
| Optical power budget,<br>worst-case | 26 dB | 18 dB |
| Bit error rate (BER) | $< 1 \times 10^{-10}$ | $< 1 \times 10^{-10}$ |
| Transceiver type | Small Form Factor Pluggable (SFP)<br>Multi-Sourcing Agreement (MSA) compliant | |
| Laser class | Class 1, IEC 825-1 Accessible Emission Limit (AEL) | |

## Location of Interface ports, LED's and DIP-switches

### ODW-710-F1




**Status**
**screw terminal**

| Position | Description | Product marking |
|---|---|---|
| 1 | Contact with C when fibre optical links are in operation | NO |
| 2 | Common | C |
| 3 | Open (no contact with C) when fibre optical links are not in operation | NC |

**PROFIBUS DP (RS-485)**
**D-sub**

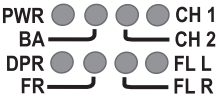
| Position | Direction* | Description |
|---|---|---|
| 1 | – | – |
| 2 | – | – |
| 3 | In/Out | RxD/TxD-P |
| 4 | Out | CNTR-P |
| 5 | – | DGND |
| 6 | Out | VP |
| 7 | – | – |
| 8 | In/Out | RxD/TxD-N |
| 9 | – | – |

**Power**
**screw terminal**

| Position | Direction* | Description | Product marking |
|---|---|---|---|
| 1 | In | Common voltage | COM |
| 2 | In | Voltage A | +VA |
| 3 | In | Voltage B | +VB |
| 4 | In | Common voltage | COM |

* Direction relative this unit

## LED Indicators



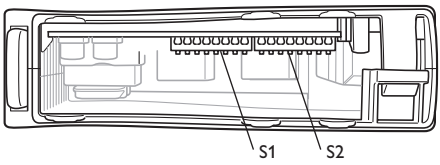

| LED | Status | Description |
|---|---|---|
| PWR<br>Power | ON | Power is on. |
| | OFF | Power is off. |
| BA<br>Bus active | ON | Data rate has been identified and data frames are being received on the electrical or optical interface. |
| | OFF | Data rate has not been identified. |
| CH 2 | Not used | |
| CH 1<br>Channel 1 link status | ON | Fibre link to other unit has been established at CH 1. |
| | Flashing | Optical power detected but link to other unit has not been established at CH 1. |
| | OFF | No optical power detected and no link to other unit has been established at CH 1. |
| DPR<br>Receive PROFIBUS DP | Flash | Data received on the electrical interface and transmitted out on the optical interface. |
| | OFF | No data received on the electrical interface. |
| FR<br>Receive fibre link | Flash | Data received on the optical interface and transmitted out on the electrical interface. |
| | OFF | No data received on the optical interface. |
| FL R<br>Failure link remote | ON | Remote fibre link failure. A fibre link is out of operation at any other unit than this one.* |
| | Flashing | Hardware error or invalid configuration. |
| FL L<br>Failure link local | ON | Local fibre link failure. A fibre link is out of operation. |
| | Flashing | Hardware error or invalid configuration. |

* Only valid if used togheter with ODW-710-F2 units in a multidrop network.
**Note:** During power up, all LED's will turn on for about 1 second.

# DIP-switch settings

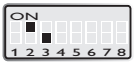
## Before setting DIP-switches:

Prevent damage to internal electronics from electrostatic discharges (ESD) by discharging your body to a grounding point (e.g. use of wrist strap).



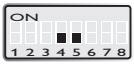

### S2 DIP-switch

Multidrop mid unit or redundant ring member. N/A for ODW-710-F1



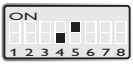

Multidrop end unit. E.g. the first or last unit in a multidrop network. Always "ON" for ODW-710-F1

Redundant ring focal point Only one focal point allowed in a ring. N/A for ODW-710-F1




65535 $t_{bit}$ interruption in receiving frames, until inactive BA.

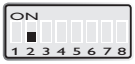
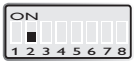
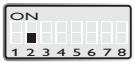
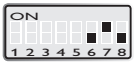
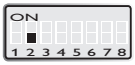
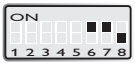
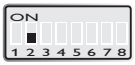
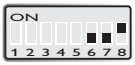
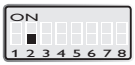
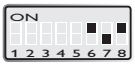
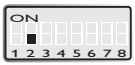
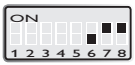
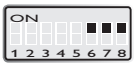
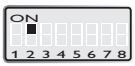
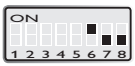
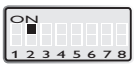
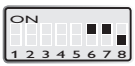
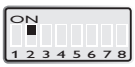
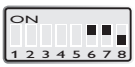
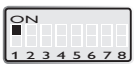
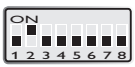
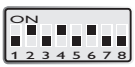
5 seconds interruption in receiving frames, until inactive BA*.




10 seconds interruption in receiving frames, until inactive BA*.

20 seconds interruption in receiving frames, until inactive BA*.

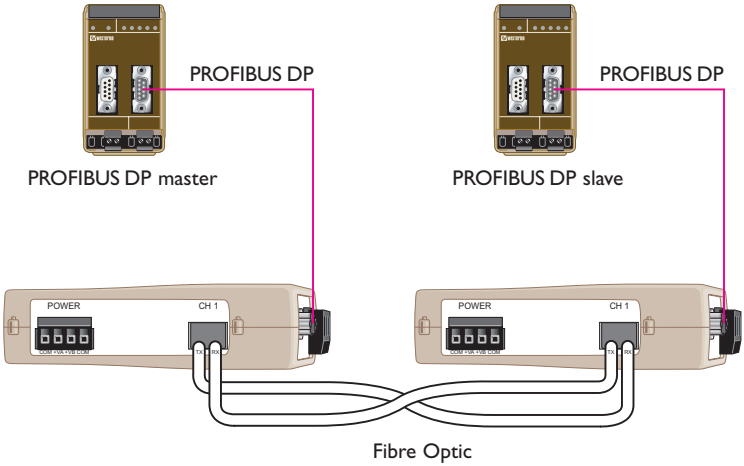
* See section "About the automatic data rate detection" on page 23 for a more detailed description.

| S1 DIP-switch | S2 DIP-switch | Description |
|---|---|---|
|  | | 1 faulty frame before data rate seen as unidentified*.<br>S1: No extended retry limit. |
|  | | 2 faulty frames before data rate seen as unidentified*.<br>S1: No extended retry limit. |
|  |  | 3 faulty frames before data rate seen as unidentified*.<br>S1: No extended retry limit. |
|  |  | 4 faulty frames before data rate seen as unidentified*.<br>S1: No extended retry limit. |
|  |  | 5 faulty frames before data rate seen as unidentified*.<br>S1: No extended retry limit. |
|  |  | 6 faulty frames before data rate seen as unidentified*.<br>S1: No extended retry limit. |
|  |  | 7 faulty frames before data rate seen as unidentified*.<br>S1: No extended retry limit. |
| |  | 8 faulty frames before data rate seen as unidentified*.<br>S1: No extended retry limit. |
| | | 31 faulty frames before data rate seen as unidentified*.<br>S1: Extended retry limit. |
|  |  | 63 faulty frames before data rate seen as unidentified*.<br>S1: Extended retry limit. |
|  |  | 127 faulty frames before data rate seen as unidentified*.<br>S1: Extended retry limit. |
|  |  | 255 faulty frames before data rate seen as unidentified*.<br>S1: Extended retry limit. |
|  | | Set status port at local fibre link (FL L) error only.<br>Only applicable if used togheter with ODW-710-F2 units in a multidrop network. |
|  |  | **Factory default** |

* See section "About the automatic data rate detection" on page 22 for a more detailed description.

## Start up guide

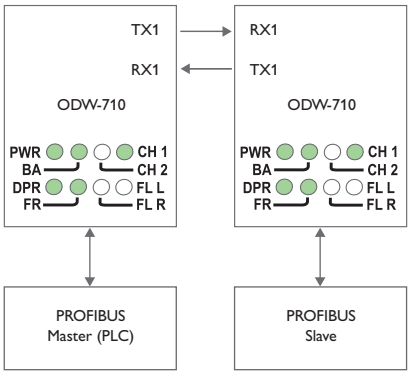
Follow the steps below to get the unit up and running in a simple application.




- Use the factory DIP-switch settings.
- Connect The fibre link between the both units.
- Connect the power supply to both units.
  The Fibre link should be in operation as indicated by the CH1 LED.
- Connect the PROFIBUS DP connectors between both ODW-710-F1 and PROFIBUS units configured to be units in the PROFIBUS DP network.
  The PROFIBUS DP will be in operation and the data rate will be automatically detected, as indicated by the BA LED.
- The point to point application is up and running.

**Note:** In an ODW-710-F1 fibre optic link there will be some additional processing delays that do not exist in an electrical bus. It is possible that the PROFIBUS application must be adjusted to accommodate for this delay. See page 21 “Calculating system processing delay” for more information on how to determine the overall system delay time.

## LED indication under normal operation

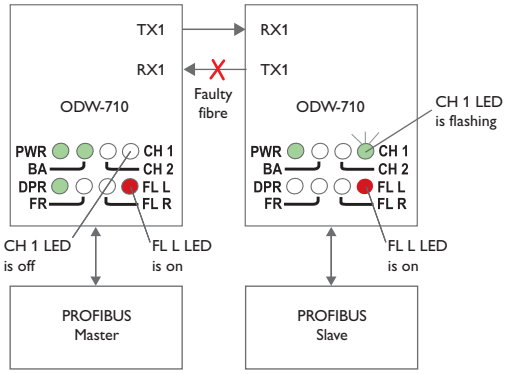



Data from the PROFIBUS master is received at the ODW-710-F1 electrical port (as indicated by the DPR LED), data rate is automatically detected (as indicated by the BA LED), data bits are retimed according to the determined rate and sent out on the optical fibre at CH 1.

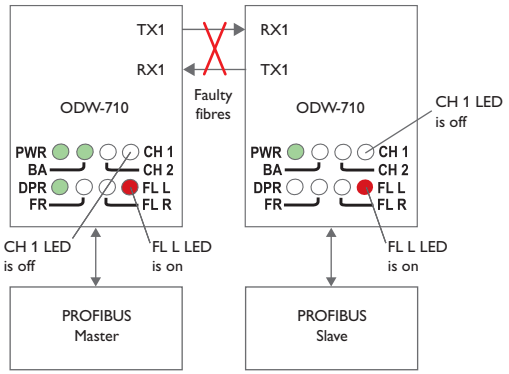
The ODW-710-F1 slave unit receives data at optical fibre CH 1 (as indicated by the FR LED), data rate is automatically detected (as indicated by the BA LED) and data is sent out on the electrical port.

Responses from the PROFIBUS slaves are processed in the same fashion and sent back to the PROFIBUS master in the opposite direction.

# LED indication during optical link failure




If one fiber in the optical fibre pair fails, all cummunication with will be lost and the FL R LED's will turn on. The ODW-710-F1 that is still sensing optical power will indicate this by flashing the CH1 LED.




If both fibers in the optical fibre pair fails, all cummunication with will be lost, the CH1 LED's will turn off and the FL R LED's will turn on.

## Calculating system processing delay

Data exchange between a PROFIBUS DP master and slave via ODW-710-F1 fibre optic link, will be delayed due to the length of the optical fibre and the signal processing within the ODW-710-F1. The signal processing delay is dependent on the data rate, and the fibre delay is dependent on the total length of the optical fibre. The additional time resulting from the optical fibre and ODW-710-F1 is the Overall system delay.

| | **Delay @ ≤ 1.5 Mbit/s** | **Delay @ 3 to 12 Mbit/s** |
|---|---|---|
| Optical fibre length delay (typical) | 5 µs/km | 5 µs/km |
| Signal processing, electrical to fibre (max) | 1 tbit + 1 µs | 9 tbit + 1 µs |
| Signal processing, fibre to electrical (max) | 0.3 µs | 0.3 µs |
| Signal processing, fibre to fibre (max) | 1.3 µs | 1.3 µs |

**Note!** tbit = 1 / Baud rate (Baud rate in bit/s)

### Example

One PROFIBUS DP master and slave using a data rate of 12 Mbit/s. and a total fibre length of 40 km. A data frame sent from the master to a slave.

**1. Fibre:** The total optical fibre length delay.
40 x 5 µs = 200 µs

**2. Converter electrical to fibre:** Signal processing delay
(ODW-710-F1 connected to PROFIBUS DP master).
9 tbit + 1 µs = 9 x 0.083 µs + 1 µs ≈ 1.1 µs

**3. Converter fibre to electrical:** Signal processing delay
(ODW-710-F1 connected to addressed slave).
0.3 µs

**4. The system delay is calculated by summing the delays in item 1 to 3 above:**
200 µs + 1.1 µs + 0.3 µs = 201.4 µs

# About the interfaces

## Power

The power terminal has two independent inputs, +VA and +VB, allowing redundant power input. The ODW-710-F1 power supply is galvanically isolated from all other interfaces.

## Optical fibre interfaces

ODW-710-F1 uses Small Form Factor Pluggable (SFP) transceivers. This means that a wide range of different fibre transceivers and connectors can be used (see page 12).

## PROFIBUS DP interface

The PROFIBUS DP interface is a female 9-position D-sub. Pin assignments are compliance with the PROFIBUS standard EN 50 170.

## Status port

The status port connects to an internal relay witch may be used to trigger an external alarm if a fault condition occurs. During normal operation pins 1 and 2 are in contact with each other, and pins 2 and 3 are isolated. During an optical link failure, or power failure, pins 1 and 2 are isolated, and pins 2 and 3 are in contact with each other.

Optical link failures can be classified in to two categories, local or remote, as indicated by the FL L and FL R LED's. A local link failure is when an optical link is down at this particular unit. A remote link failure is when an optical link is down at some other unit.

From the factory, the status port is set to trigger on both types of link failures. However, by setting DIP-switch S1:1 to the ON position, the status port will only trigger when a local link failure has occurred.

**Note:** Setting DIP-switch S1:1 ON is only applicate if using the ODW-710-F1 togheter with ODW-710-F2 in a multidrop network.

## About the automatic data rate detection

ODW-710-F1 automatically detects the data rate by monitoring incoming PROFIBUS data frames on both the electrical and optical interfaces. When the data rate has been established the BA LED will go active.

If no data frames are transmitted for a period of time the automatic data rate detection will restart and the BA LED will go inactive.

The idle time before the automatic data rate detection re-starts is set using DIP-switches S2:4 and S2:5. The factory default setting is 5 seconds.

The automatic data rate detection determines the actual data rate by listening for PROFIBUS Start Delimiters (SD1 – SD4) at the beginning of each data frame. If one or more Start Delimiters are lost the automatic data rate detection will re-start.

The number of lost Start Delimiters before the automatic data rate detection re-starts is set using DIP-switches S1:2 and S2:6 – S2: 8. The factory default setting is 31 faulty frames (31 lost Start Delimiters).

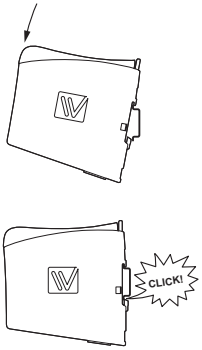
**Note:** Start Delimiters can be lost during an electrical or optical disturbance.

For example a PROFIBUS slave unit is connected/disconnected or an optical fibre is disconnected. It is advisable to start of by using the factory default settings and only manipulate them if a problem exists.

## Mounting

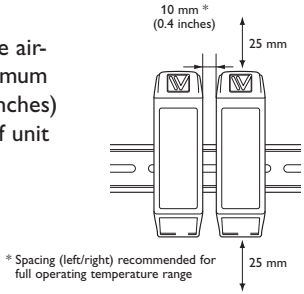
This unit should be mounted on 35 mm DIN-rail, which is horizontally mounted inside an apparatus cabinet, or similar.

Snap on mounting, see figure.



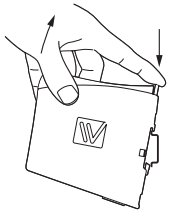

### Cooling

This unit uses convection cooling. To avoid obstructing the air-flow around the unit, use the following spacing rules. Minimum spacing 25 mm (1.0 inch) above /below and 10 mm (0.4 inches) left /right the unit. Spacing is recommended for the use of unit in full operating temperature range and service life.




### Removal

Press down the black support at the top of the unit. See figure.



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**Other Offices**

*For complete contact information, please visit our website at www.westermo.com/contact or scan the QR code with your mobile phone.*

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